DRAIN CLEARING APPARATUS AND SEALS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of priority of the following six U.S. provisional patent applications: serial number 60/396515 filed on July 16, 2002; 60/397871 filed on July 22, 2002; 60/403068 filed on August 13, 2002; 60/406023 filed on August 26, 2002; 60/406027 filed on August 26, 2002; and 60/416711 filed on October 7, 2002. The above-referenced six provisional patent applications are hereby expressly incorporated by reference.

This application discloses subject matter related to pending U.S. patent application serial number 10/465739 filed on June 19, 2003, entitled "Piston Type Drain Clearing Apparatus" and having the same inventor as the instant application.

BACKGROUND OF THE INVENTION

The invention relates to drain clearing devices and to seals used with drain clearing devices.

The common toilet plunger is well known for its use in clearing toilet drain outlets and comprises a wooden handle that terminates in a resilient, flexible rubber cup. The user depresses on the handle, deforming the rubber cup and thus creating pressure pulses that are transmitted to the obstruction; this may be repeatedly tried in the effort to unseat the obstruction.

Several problems are often encountered when attempting to use the common toilet plunger. In particular, sufficient force is often not delivered to the obstruction because of the inability to maintain an adequate seal. Even if an adequate seal of the plunger cup over the outlet is achieved, substantial physical effort may be required to successfully clear the obstruction. In addition, splashing of the toilet bowl contents can happen if the seal is not maintained while plunging.

A snake device, commonly consisting of long coiled wire, may be used. But it can require even more physical effort on the part of the user, is difficult to employ, and is messy.

For clogs in waste lines, a strong chemical agent is often used in an attempt to clear the clog. The disadvantages of this method are that the chemical agent is very caustic and must be handled with great care as well as the fact that the agent must be repeatedly purchased as it is consumed.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a bellows type drain clearing apparatus for clearing clogs from, for example, toilets, sinks and lavatories.

It is another object of the invention to provide a bellows type drain clearing apparatus that utilizes a mechanical advantage to increase the force applied to a clog in a pipe.

It is a further object of the invention to provide a seal between the drain clearing apparatus and the clogged drain pipe that minimizes splashing and maximizes the sealing effect.

It is yet another object of the invention to provide an inexpensive, easy to use, and lightweight clean-out tool that can be comfortably used by persons who lack sufficient physical strength to successfully use the common and well-known toilet plunger.

It is still another object of the invention to provide a force cup type drain clearing apparatus for clearing clogs from, for example, toilets, sinks and lavatories.

The invention will be better understood, and further objects, features, and advantages thereof will become more apparent from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, which are not necessarily to scale, like or corresponding parts are denoted by like or corresponding reference numerals.

Fig. 1 is a side view of one embodiment of a bellows type drain clearing apparatus.

Fig. 2 is a side view of the embodiment of Fig. 1 engaged with a toilet outlet opening and with the toilet shown in cross-section.

Fig. 3 is an enlarged sectional view of the seal shown in Figs. 1 and 2.

Fig. 4 is a cross-section of a seal.

Figs. 5A, 5B and 5C are cross-sectional side views of seals.

Figs. 6A, 6B and 6C are cross-sectional side views of seals.

Figs. 7A and 7B are cross-sectional views of seals and Fig. 7C is a bottom view of the seals of Figs. 7A and 7B.

Fig. 8 is a side view of a seal.

Fig. 9 is a side view of a force cup type drain clearing apparatus.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 is a side view of one embodiment of a drain clearing apparatus 10 according to the invention. Apparatus 10 includes a hollow, collapsible, generally cylindrical bellows portion 12. Bellows portion 12 has an upper end 14 and a lower end 16. A handle 18 is attached to the upper end 14 of the bellows portion 12. A seal 20 is attached to the lower end 16 of the bellows portion 12. A variety of methods may be used to attach seal 20 to the lower end 16 of bellows portion 12. By way of example, seal 20 may be formed integrally with bellows portion 12; seal 20 may threadingly engage the lower end 16 of bellows portion 12; seal 20 may snap fit over lower end 16; or seal 20 may be slipped over the lower end 16 of bellows portion 12 and attached thereto by, for example, adhesive and/or clamps.

The handle 18 and bellows portion 12 may be made of, for example, plastic or another sturdy waterproof material. The seal 20 may be made of, for example, rubber, plastic or some other waterproof material. As shown in Fig. 1, seal 20 includes three flanges 24, 26, 28 of decreasing diameter. Seal 20 includes outlet opening 32.

Fig. 2 is a side view of the embodiment of Fig. 1 engaged with a toilet outlet opening 36 and with the toilet 34 shown in cross-section. Referring now to Fig. 2, which shows the apparatus 10 positioned for use, a cross-section of a toilet 34 is shown with the apparatus 10 engaged with the toilet drain outlet 36. Seal 20 is slid into toilet drain outlet 36 until one or more

of the flanges 24, 26, 28 forms an effective seal with toilet drain opening 36. The user grips handle 18 with one or both hands and pushes downward to ensure an effective seal and compress bellows portion 12. This action causes the fluid in bellows portion 12 to be compressed and expelled out of opening 32 into toilet drain outlet 36. The pressure generated on the fluid in the bellows portion 12 is ultimately transmitted to, and dislodges, the clog 40 in pipe 42.

In a preferred embodiment, the inside diameter p of the bellows portion 12 is less than the inside diameter of the pipe 42 at the clog 40 thereby providing a distinct mechanical advantage in removing the clog 40. To gain this mechanical advantage, the inside diameter p of the bellows portion 12 is preferably less than 2.125 inches and more preferably less than 1.875 inches. The bellows portion 12, handle 18 and seal 20 may be constructed in different sizes to accommodate a longer or shorter drain clearing apparatus. Further, the size of the opening 32 in seal 20 may be varied to accommodate different diameter drain openings such as sink drains, bathtub drains, floor drains and the like. However, to retain the important mechanical advantage, the inside diameter p of the bellows portion 12 must be less than the inside diameter of the pipe 42 at the clog 40.

Fig. 3 is a cross-section of seal 20 attached to lower end 16 of bellows portion 12. In the embodiment of Fig. 3, seal 20 is preferably formed integrally with bellows portion 12. Seal 20 comprises a hollow cylinder 22, which may be rigid or flexible. The external surface of the cylinder 22 includes at least one flange 24 disposed thereon. Seal 20 may have additional flanges 26 and 28 disposed thereon. Seal 20 may also have more than three flanges. When more than one flange is used, the diameters d of the flanges preferably decrease in a direction away from the bellows portion 12 of the apparatus. For example, in Fig. 3, the diameter of flange 28 is less than the diameter of flange 26 and the diameter of flange 26 is less than the diameter of flange 24.

Each flange 24, 26, 28 preferably angles up and away from the hollow cylinder 22. The angle alpha of each flange with the longitudinal centerline of the seal is preferably in the range of about 30 degrees to about 60 degrees. By way of example and not limitation, the diameter of flange 24 may be about 3.26 inches, the diameter of flange 26 may be about 2.96 inches and the diameter of flange 28 may be about 2.7 inches. The thickness of each flange may be, for

example, about 0.16 inches. While flanges 24, 26, 28 may be rigid or flexible, it is preferred that the flanges are flexible, to better interact with the opening to be sealed. In Fig. 3, seal 20 is shown attached to lower end 16 of bellows portion 12, however, seal 20 may be used with other types of drain clearing apparatus, such as piston type drain cleaners.

Fig. 4 is a cross-section of a seal 53 attached to the lower end 38 of a drain clearing apparatus, such as a bellows or piston type apparatus. Seal 53 includes a shoulder portion 60 that engages the lower end 38 of the drain clearing apparatus. Shoulder portion 60 may be attached to end 38 by a variety of methods. For example, shoulder portion 60 and end 38 may be threaded; shoulder portion 60 may snap fit over lower end 38; or shoulder portion 60 may be slipped over lower end 38 and attached thereto by, for example, adhesive and/or clamps. It should be noted that seal 20 shown in Fig. 3 may also include a shoulder portion 60 and be attached to the lower end 12 by the methods described above.

Seal 53 comprises a hollow truncated cone 52, which may be rigid or flexible. The external surface of the truncated cone 52 includes at least one flexible flange 54 disposed thereon. Seal 53 may have additional flexible flanges 56 and 58 disposed thereon. Seal 53 may also have more than three flexible flanges. When more than one flange is used, the diameters f of the flanges preferably decrease in a direction away from the lower end 38 of the drain clearing apparatus. For example, in Fig. 4, the diameter of flange 58 is less than the diameter of flange 56 and the diameter of flange 56 is less than the diameter of flange 54. Each flange 54, 56, 58 preferably angles up and away from the truncated cone 52. The angle beta of each flange with the longitudinal centerline of the seal 53 is preferably in the range of about 30 degrees to about 60 degrees. By way of example and not limitation, the diameter of flange 54 may be about 3.26 inches, the diameter of flange 56 may be about 2.96 inches and the diameter of flange 58 may be about 2.7 inches.

Fig. 5A is a cross-section of a seal 62 attached to the lower end 38 of a drain clearing apparatus, such as a bellows or piston type apparatus. Seal 62 comprises a hollow cylinder 44, which may be rigid or flexible. The external surface of the cylinder 44 includes at least one flexible flange 46 disposed thereon. Fig. 5B is a cross-section of a seal 48 having a hollow

cylinder 44 and two flexible flanges 46, 50. Fig. 5C is a cross-section of a seal 62 having a hollow cylinder 44 and three flexible flanges, 46, 50, 54. Seals with more than three flexible flanges are also within the scope of the invention.

As shown in Figs. 5B and 5C, when more than one flange is used, the diameters of the flanges preferably decrease in a direction away from the lower end 38. For example, in Fig. 5B, the diameter of flange 50 is less than the diameter of flange 46. Similarly, in Fig. 5C, the diameter of flange 54 is less than the diameter of flange 50 which is less than the diameter of flange 46. Each flange 46, 50, 54 includes an underside 47, 51, 55 that preferably angles up and away from the hollow cylinder 44 of the seals. The angle theta of the undersides 47, 51, 55 of flanges 46, 50, 54 with the longitudinal centerline of each seal is preferably in the range of about 30 degrees to about 60 degrees.

Fig. 6A is a cross-section of a seal 76 attached to the lower end 38 of a drain clearing apparatus, such as a bellows or piston type apparatus. Seal 76 comprises a hollow truncated cone 78, which may be rigid or flexible. Cone 78 has an external surface with at least one flexible flange 80 disposed thereon. The larger diameter end of the cone 78 is attached to lower end 38 by, for example, fasteners such as screws, grommets or clamps and/or an adhesive. Fig. 6B is a cross section of a seal 86 having a hollow truncated cone 78 and two flexible flanges 80, 82. Fig. 6C is a cross-section of a seal 88 having a hollow truncated cone 78 and three flexible flanges, 80, 82, 84. Seals with more than three flexible flanges are also within the scope of the invention.

As shown in Figs. 6B and 6C, when more than one flange is used, the diameters of the flanges preferably decrease in a direction away from lower end 38 of the apparatus. For example, in Fig. 6B, the diameter of flange 82 is less than the diameter of flange 80. Similarly, in Fig. 6C, the diameter of flange 84 is less than the diameter of flange 82 which is less than the diameter of flange 80. Each flange 80, 82, 84 includes an underside 81, 83, 85 that preferably angles up and away from the hollow truncated cone 78 of the seals. The angle theta of the undersides 81, 83, 85 of flanges 80, 82, 84 with the longitudinal centerline of each seal is preferably in the range of about 30 degrees to about 60 degrees.

Referring now to the flanged seals shown in Figs. 3, 4, 5A-C and 6A-C, as the flanges are inserted into the drain outlet, the flanges are compressed inward. Because of the angle of the flanges, the flanges grip the inner walls of the drain outlet to form a biased seal. The biased seal requires more force to remove the flanges than was required to insert the flanges into the drain opening. Thus, this novel sealing mechanism is able to resist significant backpressure during use and allows the user to use much less downward force on the device to maintain an effective seal.

Fig. 7A is a cross-sectional view of a seal 90 attached to the lower end 38 of a drain clearing apparatus, such as a bellows or piston type apparatus, by, for example, adhesive bonding. Seal 90 is substantially donut or ring shaped. Seal 90 comprises, for example, a solid elastomeric material 92. Seal 90 provides a large contact area between the seal 90 and the surface around a drain opening. The large contact area provides more stability to the drain clearing apparatus during use and thus increases the likelihood of maintaining an effective seal.

Fig. 7B is a cross-sectional view of a seal 94 attached to the lower end 38 of a drain clearing apparatus, such as a bellows or piston type apparatus. Seal 94 is substantially donut or ring shaped, hollow and comprises an elastomeric material filled with a fluid 96. The fluid-filled seal 94 may contain air, water or any other fluid under low pressure which allows the seal 94 to conform to surface imperfections surrounding waste-line drains and to the user's non-uniform application of force during use. The seal 94 exerts uniform pressure over its contact area due to the fluid 96 being of homogeneous pressure, thereby providing an effective seal for the device over a waste-line opening. Fig. 7C is a bottom view of the seals 90, 94 of Figs. 7A and 7B showing the donut or ring shape. Seals 90 and 94 are preferably used for waste lines such as sinks and lavatories, but may also be used with toilets.

Fig. 8 is a side view of a seal 180 attached to the lower end 38 of a drain clearing apparatus, such as a bellows or piston type apparatus. Seal 180 comprises a hollow, truncated conical portion 182, a hollow cylindrical portion 184 joined to the conical portion 182 and a substantially donut shaped portion 186 disposed at a junction of the conical and cylindrical portions. The larger diameter end 188 of the conical portion 182 is attached to the lower end 38 of the apparatus. In one preferred embodiment, the substantially donut shaped portion 186

comprises a compressible, solid elastomeric material. In another preferred embodiment, the substantially donut shaped portion 186 is hollow and comprises an elastomeric material filled with a fluid, such as air. The hollow, truncated conical portion 182 and hollow cylindrical portion 184 are preferably integrally formed from plastic.

Fig. 9 is a side view of a force cup type drain clearing apparatus or plunger 100. The plunger 100 includes a handle 102, a force cup 104, and a hollow, sealed, flexible, fluid-filled, tubular ring seal 94 (See Fig. 7B) attached to the bottom of the force cup 104. The fluid-filled sealing ring 94 may contain air, water or any other fluid under low pressure which will allow the ring 94 to conform to surface imperfections surrounding waste-line drains and to the user's non-uniform application of force during use. When engaged over a waste-line drain opening, the sealing ring 94 will exert uniform pressure over its contact area due to the fluid inside the ring 94 being of homogeneous pressure. This provides an effective seal for the plunger 100 when the force cup 104 is deformed as downward force is exerted on the handle 102 during use.

The handle 102 of the plunger 100 will typically be fashioned from wood or another rigid material and may be attached to the force cup 104, which is preferably rubber, via any viable mechanism. The sealing tubular ring 94 is part of or attached to the bottom of the force cup 104 and is preferably made of rubber.

While the invention has been described with reference to certain preferred embodiments, numerous changes, alterations and modifications to the described embodiments are possible without departing from the spirit and scope of the invention as defined in the appended claims, and equivalents thereof.